

IN THE CLAIMS

Please cancel claims 1-7.

Please amend claim 8 as follows:

1 8. (Amended) A transistor device having a gate electrode
2 overlying a gate dielectric formed directly on a semiconductor
3 substrate, the gate dielectric comprising:
4 a first dielectric material having a first dielectric
5 constant; and
6 a second dielectric material having a second dielectric
7 constant different from the first dielectric constant.

Please add claims 15-21 as follows:

1 15. (New) An apparatus comprising:
2 a semiconductor substrate having a transistor device formed
3 thereon, the transistor device having a gate dielectric disposed
4 directly between a surface of the substrate and a gate electrode
5 comprising:
6 a first dielectric material having a first dielectric
7 constant; and
8 a second dielectric material having a second dielectric
9 constant different from the first dielectric constant.

1 16. (New) The apparatus of claim 15, wherein the second
2 dielectric constant is greater than the first dielectric constant.

Sub
G¹
1 17. (New) The apparatus of claim 15, wherein the first material
2 has a first thickness and the second material has a second
3 thickness, the combination of the first thickness and the second
4 thickness defining a total thickness less than one-third of the
5 length of a transistor gate adapted to overly the gate dielectric.

Ant
Q2
1 18. (New) The apparatus of claim 15, wherein the first material
2 thickness and the second material thickness are determined by the
3 relationship
4

$$t_1/k_1 + t_2/k_2 = t_{ox}/k_{ox}$$

5 wherein t_1 is the first material thickness,

6 t_2 is the second material thickness,

7 t_{ox} is the minimum thickness for a gate dielectric of
8 silicon dioxide for a chosen gate length,

9 k_1 is the dielectric constant for the first dielectric
10 material,

11 k_2 is the dielectric constant for the second dielectric
12 material, and

13 k_{ox} is the dielectric constant of silicon dioxide.

- 1 19. (New) The apparatus of claim 15, wherein the first gate
2 dielectric material is selected from one of silicon nitride, HfO_2 ,
3 BaO , La_2O_3 , Y_2O_3 , and ZrO_2 .
- 1 20. (New) The apparatus of claim 15, wherein the second
2 dielectric material is selected from one of BST and PZT.
- 1 21. (New) The apparatus of claim 15, further comprising a third
2 dielectric material having a third dielectric constant.

REMARKS

Claims 1-14 were examined. Claims 1-7 are canceled. Claim 8 is amended. Claims 15-21 are added. Claims 8-21 remain in the application. The Examiner rejects the claims under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 5,619,051 issued to Endo (Endo) in view of U.S. Patent No. 4,015,281 issued to Nagata et al. (Nagata).

Endo relates to a floating-gate EEPROM device wherein a floating gate is separated by a control gate, in Figure 6, by a two-layer dielectric film.

The two dielectric materials are selected such that the relative permittivity [dielectric constant] ϵ_2 of the laminar film 18B as a whole is appropriate than that, ϵ_1 , of the gate dielectric film 14. It is preferable that the forbidden band in the bottom layer 18a is wider than that in the top layer 18b.